

Trigen Response to EPA February 18th Issues/Questions

Updating Output Emission Limitation Workgroup
March 25, 1999 Meeting

1. Steam Measurement Equipment Issues

Trigen has already provided detailed information to the EPA on steam measurement equipment. An additional copy of the original powerpoint presentation is attached.

- *What percentage of industrial units measure steam output?*

We estimate that 80% of industrial boilers measure steam output from their boilers. Typically the data is recorded on barrel graphs (chart recorders) and sometimes transcribed into a spreadsheet format. All of Trigen's boiler and CHP facilities measure steam output.

- *Do most industrial units measure pressure and temperature as part of measuring steam output?*

The vast majority of industrial boilers operate at a constant pressure and they just measure flow. Most of Trigen's boiler and CHP facilities measure temperature and pressure as part of measuring the steam output.

Looking forward it is important to measure the pressure and temperature of steam flow since this is the only true way to determine the energy content of the steam. It is particularly critical to measure these values at the outlet of a boiler since steam leaving a boiler is typically superheated.

- *Where is steam measured from industrial boilers?*

We estimate that 90% of industrial boilers measure steam at the outlet of the boiler as it enters a steam header. Some facilities may only measure steam at a common steam header that multiple boilers feed into but we believe that it is rare. Probably 10% of industrial boiler facilities measure feedwater into the boiler instead of steam out of the boiler. All of Trigen's boiler and CHP facilities measure steam at the boiler or HRSG and at the "gate" to the thermal distribution system. We also meter steam to most internal processes and to all of our customers throughout the distribution system.

- *Is the accuracy of steam (thermal) output measurement comparable to that of electricity?(1 to 2% of full scale)*

The vast majority of the existing industrial boiler steam meters are of a +/- 10% accuracy. However there are a number of facilities, like Trigen's that have upgraded their metering systems to achieve accuracy's of 1 to 2% of reading. Steam metering is made more difficult by the limited turndown ratios of various metering technologies. Recent strides in steam measurement technology are minimizing this problem.

- *What quality assurance procedures do plants use to ensure the accuracy of steam measurement?*

In-plant meters are typically treated as part of the plant's instrumentation. Because of this they are calibrated on a routine basis which is usually every 6 to 12 months. Meters in the field are generally calibrated every 18 to 24 months. Due to advances in technology, modern meters are extremely stable and calibrations drift little over time. Since plant performance is typically gauged by these meters, current readings are constantly compared to historical readings to ensure their accuracy.

- *Are there standards that apply to measurement of steam, including quality assurance procedures? If so, are these standards widely used by industry?*

As with most plant instrumentation, plant meters are calibrated using NIST traceable standards. The instruments used to do the calibrations are typically sent out every 6 to 12 months to be calibrated by a certified lab. Many steam systems are regulated by a public utility commission which dictates and regulates certain accuracy standards. Many utility commissions must approve metering technologies before they can be used for custody transfer.

2. Net vs Gross steam output:

- *Are steam output measurements for an industrial unit usually on a gross basis, a net basis, both or neither?*

The majority of industrial boiler facilities measure gross output from the boiler. Any facilities that treat their boiler plant as a cost center are more likely to measure net production and they are also more likely to meter their "customers". Virtually all district energy facilities measure on a net and gross basis and most, if not all, independent power providers (i.e. cogenerators) which serve industrial facilities do the same.

- *Is there an equivalent of net electricity for an industrial boiler? (That is, an output that is sold by the company.) If so, what is it?*

Yes. Steam may be used in the plant to accomplish many tasks including to drive motors, for deaeration and preheating, to inject into a turbine for pollution control, for internal heating, for keeping #6 oil warm and free flowing, etc. Gross generation minus these auxiliary loads is net generation that would be measured at the delivery point from the boiler plant to the distribution system or into a process would be the net generation of steam (or hot water).

- *How would an industrial plant determine or measure net output for a unit?*

The most common method to measure net input is directly using a meter after all the auxiliaries. It could also be possible to measure net output by difference by subtracting metered output to auxiliaries from gross output. Trigen recommends that EPA require the installation of a meter at the point of delivery of the steam to a distribution system or a process.

Trigen would like to emphasize that we believe that the determination of net output is the appropriate measure from an environmental policy standpoint. Please keep in mind that electric generators and industrial boilers exist solely to convert fuel into a more flexible, usable energy product. The guiding objective should be to encourage the maximum efficiency possible in converting the fuel to useful energy products that get subsequently used in various processes. As energy suppliers, either third party providers or internal providers, we should be encouraged to weigh the various options available to us to employ different technologies and fuels to achieve the objective of converting fuel to energy products. We can weigh the costs and benefits associated with fuel choice, use of electrical and thermal energy for pollution control and other factors including additional capital investment to improve overall efficiency, once the appropriate market signals are provided. The key advantage of allocating allowances based on output, and more generally adopting output-based performance standards, is that it recognizes the benefit of pollution prevention.

3. Commercial value of steam

- *How is steam or thermal energy useful in industrial processes?*

Steam and hot water are used for hundreds of processes in addition to being used for heating and cooling. Steam can be used to drive motors and pumps, boil and separate chemicals and petroleum products, process food, etc. Many industries use steam. It is important to note that many processes which could use steam or electricity to the same amount of work could be served less expensively and with substantially less environmental impact by using steam as opposed to electricity. The attached case study [The Value of Thermal Energy – The BMC Microbrewery] illustrates this point.

- *How is steam or thermal energy used within a plant?*

See above

- *How do industrial plants recover the cost of generating steam or thermal energy?*

Various industrial facilities look at thermal energy production differently. In many cases, industrial facilities only look at fuel costs. But more and more, as the boiler plants are viewed as cost centers within competitive industries, thermal energy is “sold” internally to various “customers” who use the thermal energy. This is a very common practice where the energy supply responsibilities have been outsourced. In one facility that Trigen serves, the pricing of various thermal energy products to many different processes has helped that facility accomplish a 20% reduction in the energy use per unit of product in only 3 years.

- *Do industrial plants sell thermal energy?*

Some industrial plants sell thermal energy either internally or externally. Certainly the district energy industry (which predominantly uses industrial boilers) sells thermal energy to many external customers.

4. Appropriateness of comparing and converting steam and electric output

- *Should steam output be converted to electrical output? If so, which method should be used to convert steam energy to electrical power equivalent? If steam energy were not converted, how could emission limitations be treated for cogenerators?*

Steam should not be converted to electricity. See answers to other questions below.

- *How can steam be treated equitably for industrial boilers and cogenerators?*

Trigen agrees with a proposal that has been offered by other participants in this process. In short it describes a straightforward approach to allocating based on output without conversion and without confusing the pools. This approach is to combine the EGU and non-EGU pools into one pool. Under this approach we would allocate allowances from the total pool to each source at 1.5 lb/MWh electric and 2 lb/MMBtu out for any output from the source. Cogeneration units receive allocations for both forms of output.

- *What assumptions, if any, should be made about the efficiency of conversion from steam output to electrical output?*

No conversion steam/electric conversion is necessary.

- *If steam output data were not available from industrial boilers, how would states allocate allowances to cogenerators?*

This is a short-term problem that will be alleviated by EPA starting the process of requiring that thermal data be collected. However, in the short term we agree with a proposal that has been offered by other participants in this process: First allocate allowances to power generators based on electric output and allocate allowances to industrial boilers based on their heat input. For cogenerators, convert the thermal output to an equivalent input by dividing the thermal output by an average industrial boiler efficiency, possibly on the order of 80 percent. The exact value could be set through a consultative process with affected parties. Use the equivalent heat input as the basis to allocate allowances to the cogenerators for their heat input in the same way as all other industrial boilers.